Bibliometric Evaluation of Computer Science – Problems and Pitfalls

Friedemann Mattern
ETH Zurich

Bibliometry?

- Counting of publications and citations
  - measuring the output and the impact of scientific research

- Evaluating and ranking people and institutions
Bibliometry Has Become Popular

- Politics and the public want to have simple indicators
  - transparency

- “You can’t manage what you can’t measure”
  - measure quantity → measure of research quality?

- Alternative to peer review
  - mistrust in “subjective” experts
  - bibliometric evaluation is cheaper

Bibliometry is Being Used

- to evaluate and compare
  - Nations
  - Institutions
  - Disciplines
  - People
Comparing Nations

Wealth intensity (GDP/person)

Citation intensity (citations/paper)

"Bang for the Buck": To get cited you have to be rich?

To become rich you have to be cited?

Counterexample: Luxembourg


Comparing Nations

Citations (millions)

United States

EU-15

Japan

East Asia

Science and Engineering Indicators 2006
National Science Board
Computer Science 2001-2003
Articles Cited in the Year 2005

- All ("ISI journals"): US: 36.1% EU: 31.6%
- 99th citation percentile: US: 69.3% EU: 16.6%

Interpretation: In Computer Science, US research has higher influence than EU research

THE WORLD’S TOP 200 UNIVERSITIES
The Times Higher Education

Comparing Institutions

<table>
<thead>
<tr>
<th>RANK</th>
<th>UNIVERSITY</th>
<th>COUNTRY</th>
<th>QS 2009</th>
<th>QS 2008</th>
<th>REPUTATION</th>
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<th>RESEARCH</th>
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Comparing Institutions

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
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<tr>
<td>1</td>
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<td>Princeton University</td>
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<td>10</td>
<td>Ecole Polytechnique</td>
</tr>
<tr>
<td>11-27</td>
<td>Duke University, Imperial College, London, Cornell University, Beijing University, Tokyo University, University of California, San Francisco, University of Chicago, Melbourne University, Columbia University, ETH Zurich</td>
</tr>
</tbody>
</table>

ETH Rank in the Specific Citations per Faculty Indicator

- 2004: Rank **3** (ETH was called „citations champion“)
- 2005: Rank **71**
- 2006: Rank **24**
- 2007: Rank **120**
What are ETH Research Assistants? PhD Students or Faculty Members?

- 377 Professors, 3606 research assistants

ETH Rank in the Specific Citations per Faculty Indicator

- 2004: Rank 3 (ETH is called "citations champion")
- 2005: Rank 71
- 2006: Rank 24
- 2007: Rank 120

- Faculty: head count → full time equivalent
- Publications: ISI DB, 5 years window → Scopus DB, 10 years window

⇒ Global ranking position of ETH Zurich down to 42
"Bibliometric indicators are used in many rankings. Because bibliometric analysis currently concentrates on the so-called "ISI World", it is important for ETH to make its research results visible in these journals as far as possible. Hence I call upon you to make intense use of the publication opportunities of the ISI journals."

Comparing Disciplines

Colorful display of bibliometric data of Swiss Universities in the media

**Interpretations in the media:**
- At ETH Zurich, chemistry is top
- Computer science is only average

**This is nonsense**
Bibliometry is Being Used

- to evaluate and compare
  - Nations
  - Institutions ← be careful
  - Disciplines ← be extremely careful
  - People ← not possible (without domain expertise)

Bibliometry is harmful
- handle with care!
The ISI Science Citation Index (or “Web of Science”)

- Most bibliometric evaluations are based on it
  - Institute for Scientific Information
  - now Thomson Reuters (commercial)

- Analyze ~8700 journals (~350 from the “field of CS”)
- Only few conference proceedings and books
- Emphasis on natural sciences and life sciences
- Technical sciences are under-represented

- Is the ISI database suitable for CS?

ISI-Coverage is Very Different for Different Disciplines

Analysis of all publications from ETH Zurich in 2003:

- Physics, chemistry, biology: ~60%
- CS: 14%
Does ISI Cover At Least All Relevant Publications?

- Relevant = cited
- How many [non] ISI papers do ISI papers cite?

Non-ISI

ISI

[7] Personal communication
[26] Detailed statistics in TR 314

Never catch 100%

ISI Internal Coverage Percentage

Biology: 90%
CS: 40%

- ISI misses more than 50% of all publications considered relevant by the CS-community
- better in theoretical CS, worse in practical CS
- “25% of groups had a coverage above 46%, and 25% below 28%” [CWTS study 2007]

Adding proceedings from ACM, IEEE-CS, and LNCS yields 51%

Henk F. Moed and Martijn S. Visser: Developing Bibliometric Indicators of Research Performance in Computer Science. CWTS, 2007
How Relevant are Conferences?

- Conference proceedings are typically not covered by ISI
  → miss of many citations even for journal articles

- **Claim:** For CS,
  1) the majority of papers appear in conference proceedings
  2) the top-cited conferences and workshops are as significant as journals and have to be considered

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**Publication Venues of Computer Science Papers**

Henk F. Moed and Martijn S. Visser: Developing Bibliometric Indicators of Research Performance in Computer Science: An Exploratory Study.
Centre for Science and Technology Studies (CWTS), Leiden University, the Netherlands.
Conferences and Workshops

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<thead>
<tr>
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<th>#venues</th>
<th>#papers (all)</th>
<th>#citations per paper</th>
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Data source: MS Libra computer science bibliography search engine, Dec. 2007


A Small Sample from 2300 CS Conferences / Workshops

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<tr>
<th>Conference</th>
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<th>Cit/Publ</th>
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<tr>
<td>SIGCOMM</td>
<td>945</td>
<td>33546</td>
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<tr>
<td>MOBICOM - Mobile Computing and Networking</td>
<td>430</td>
<td>14771</td>
<td>34.35</td>
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<tr>
<td>POPL - Symposium on Principles of Programming Languages</td>
<td>1106</td>
<td>32595</td>
<td>29.47</td>
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<tr>
<td>SIGMOD – Intl. Conf. on Management of Data</td>
<td>2457</td>
<td>53347</td>
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<td>SIGGRAPH – Ann. Conf. on Computer Graphics</td>
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<td>59966</td>
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<td>VLDB - Very Large Data Bases</td>
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<td>39418</td>
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<td>ECOOP - European Conference on Object-Oriented Programming</td>
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<td>7881</td>
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<td>STOC - ACM Symposium on Theory of Computing</td>
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<td>WWW - World Wide Web Conference Series</td>
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<td>PODC - Symposium on Principles of Distributed Computing</td>
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<td>FOCS - IEEE Symposium on Foundations of Computer Science</td>
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<td>SODA - Symposium on Discrete Algorithms</td>
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<td>EUROCRYPT - Theory and Application of Cryptographic Techniques</td>
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<td>7835</td>
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<tr>
<td>UbiComp - Ubiquitous Computing</td>
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<tr>
<td>MobiSys - Int. Conf. on Mobile Systems, Applications, and Services</td>
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<td>593</td>
<td>6.74</td>
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<tr>
<td>IJCAI - International Joint Conference on Artificial Intelligence</td>
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<td>30435</td>
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<tr>
<td>ACM SenSys</td>
<td>244</td>
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<tr>
<td>CHI - Computer Human Interaction</td>
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<tr>
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<td>PARLE - Parallel Architectures and Languages Europe</td>
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<td>STIGOPS European Workshop</td>
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F. Mattern, ETH Zurich, 2008
A Small Sample from 2300 CS Conferences / Workshops

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<th>Conference</th>
<th>Publications</th>
<th>Citations</th>
<th>Cit/Publ</th>
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<td>Pervasive Computing</td>
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<td>ALENEX - Algorithm Engineering &amp; Experimentation</td>
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<td>Wirtschaftsinformatik</td>
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<td>Fuzzy Systems and Knowledge Discovery</td>
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Conference and Workshops

- In CS a conference paper may very well be a **final product in itself**
  - therefore, researchers may not seek to have their conference papers published in journals
  - contrary to other disciplines such as Physics!

- Conference proceedings **must not be excluded**
  - be aware of **variance in quality**: “there are more highly cited but also more poorly cited proceedings volumes than there are annual journal volumes” [CWTS study 2007]
The 250 Mostly Cited CS Researchers (According to ISI)

“Scientist rankings in computer science”

1. HIGGINS, DG
2. FUCHS, R
3. BLEASBY, AJ
4. BILLETER, M
5. KORADI, R
6. WUTHRICH, K
7. SJOSTRAND, T
8. EVANS, SV
9. WAS, Z
10. SEYMOUR, MH
11. JADACH, S
12. OVERBEEK, R
13. WEBBER, BR
14. ABBEIENDI, G
15. KNOWLES, IG
16. ...

Whom do you recognize?

2. Rainer Fuchs: Predicting protein function: a versatile tool for the Apple Macintosh
3. Alan J. Bleasby: Information Resources for the Bioinformatician

This is CS in the ISI sense!

Mostly Cited European Computer Science Researchers (ISI)

- Abiteboul, Serge
- Aulin, Tor M.
- Balbo, Gianfranco
- Benedetto, Sergio
- Bergstra, Jan A.
- Biglieri, Ezio
- Binnig, Gerd K.
- Broy, Manfred
- Büttiker, Markus
- Caceci, Marco S.
- Chlamtac, Imrich
- Courcelle, Bruno
- De Nicola, Rocco
- Du Croz, Jeremy
- Dubois, Didier
- Duff, Iain Spencer
- Engelfriet, Joost
- Ferrari, Domenico
- Flajolet, Philippe
- Girard, Jean Yves
- Gottlob, Georg
- Hagenauer, Joachim
- Hammarling, Sven
- Hennessy, Matthew
- Henzinger, Thomas
- Hoare, C. Anthony R.
- Klop, Jan Willem
- Lovasz, László
- Lupas Scheiterer, R.
- Mallat, Stéphane G.
- Marsan, Marco Ajmone
- Mehlhorn, Kurt
- Milner, Robin
- Montanari, Ugo
- Montorsi, Guido
- Overmars, Mark H.
- Parrow, Joachim
- Polymoros, Andreas
- Prade, Henri
- Pradhan, Dhiraj K.
- Rohrer, Heinrich
- Roscoe, A. William
- Rozenberg, Grzegorz
- Schöning, Uwe
- Ungerboeck, Gottfried
- van Leeuwen, Jan
- Vuillemin, Jean
- Walker, David

www.isihighlycited.com
Mostly Cited European Computer Science Researchers (ISI)

- Abiteboul, Serge
- Aulin, Tor M.
- Balbo, Gianfranco
- Benedetto, Sergio
- Bergstra, Jan A.
- Biglieri, Elio
- Binnig, Gerd K.
- Broy, Manfred
- Büttiker, Markus
- Caceci, Marco S.
- Chlamtac, Imrich
- Courcelle, Bruno
- De Nicola, Rocco
- Du Croz, Jeremy
- Dubois, Didier
- Duff, Iain Spencer
- Digital Phase Modulation
- Ferrari, Domenico
- Digital Transmission Theory
- Girard, Jean-Jacques
- Goel
- Principles of Digital Transmission: With Wireless Applications
- Hachtel, Andreas
- Hammarling, Sven
- Henzinger, Thomas
- Fitting curves to data (Byte, 1984)
- A Wavelet Tour of Signal Processing
- Walker, David
- Mehlhorn, Kurt
- Marsan, Marco Ajmone
- Montanari, Ugo
- Naur, Peter
- Oppenheimer, Wayne
- Parrow, Joachim
- Pradhan, Dhiraj K.
- Rohrer, Heinrich
- Schöning, Uwe
- Schönhage, Arnold
- Walker, David

Turing Award – the Last 10 Years

- 2007 Edmund Clarke
- 2007 Allen Emerson
- 2007 Joseph Sifakis
- 2006 Frances Allen
- 2005 Peter Naur
- 2004 Vinton G. Cerf
- 2004 Robert E. Kahn
- 2003 Alan Kay
- 2002 Leonard M. Adleman
- 2002 Adi Shamir
- 2002 Ronald L. Rivest
- 2001 Kristen Nygaard
- 2001 Ole-Johan Dahl
- 2000 Andrew Chi-Chih Yao
- 1999 Frederick P. Brooks
- 1998 James Gray

Almost disjoint from the 250 highly cited ISI CS researchers!
Harmful to
ISI Database is Irrelevant for CS

- Wrong definition of CS
  - ~ computational science, signal processing,…
- Low coverage
  - e.g., very few conference proceedings
- Yields nonsense results

► But almost all bibliometric evaluations are based on the ISI database!

The Shanghai Ranking
“Academic Ranking of World Universities”

<table>
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<tr>
<th>Criteria</th>
<th>Indicator</th>
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<td>Quality of Education</td>
<td>Alumni of an institution winning Nobel Prizes and Fields Medals</td>
<td>10%</td>
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<tr>
<td>Quality of Faculty</td>
<td>Staff of an institution winning Nobel Prizes and Fields Medals</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Highly cited researchers in 21 broad subject categories</td>
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</tr>
<tr>
<td>Research Output</td>
<td>Articles published in <em>Nature and Science</em></td>
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</tr>
<tr>
<td></td>
<td>Articles in <em>Science Citation Index</em>-expanded, Social Science Citation Index</td>
<td>20%</td>
</tr>
</tbody>
</table>

Not much one can do about that
Peter Lee (CMU): Science and Nature – Where’s the Computing Research?

“There isn’t much computing research in the major core-science publications. I took a quick scan over the past 5 issues of Science and Nature. Over those issues, in Science one sees 35 research articles and reports in the biology and medical science areas, 14 in chemistry/materials, 10 in earth and atmospheric sciences, 5 in astronomy and astrophysics, and several in physics, psychology, and archeology. Only one article in computer science! In Nature, the situation is even more stark. In the last 5 issues we see 11 research articles in biology, 2 in chemistry, 1 in astrophysics, and 1 in psychology. None in computer science.” www.cccblog.org Sep 12, 2008

Why should we care about this?
- In the eyes of the natural sciences, we cannot be taken serious
- Image of CS, particularly in the lay public, is a concern
- Science, Nature,... generate news in the more mainstream press

Correlations
Shanghai / Times Ranking

"The correlations are quite weak, testifying that the choice of indicators the rankings are based on is significantly influencing the rankings."
Other Bibliometric Databases?

- **SCOPUS**: Citation data base from Elsevier
  ~ 15000 journals
  ~ 500 conference proceedings

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**SCOPUS: Top 20 Cited Articles in Computer Science (2004 – 2008)**

### SCOPUS: Top 20 Cited Articles in Computer Science (2004 – 2008)

<table>
<thead>
<tr>
<th>Article</th>
<th>Title</th>
<th>Authors</th>
<th>Year</th>
<th>Journal</th>
<th>Volume</th>
<th>Issue</th>
<th>Pages</th>
<th>Cited by</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>Basic concepts and taxonomy of dependable and secure computing.</td>
<td>Avizienis, A.</td>
<td>2004</td>
<td>IEEE Transactions on Dependable and Secure Computing</td>
<td>1</td>
<td>1</td>
<td>pp 11-33</td>
<td>285</td>
</tr>
</tbody>
</table>

### Other Bibliometric Databases?

- **Google Scholar** and **Citeseer**
  - very popular, easy to use
  - online tools like “publish or perish” are based on it

- But *what exactly do they count*, and what do the counts reflect?
  - citations from theses of master students?
  - citations from web pages that are no publications?

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F. Mattern, ETH Zurich, 2008

19
<table>
<thead>
<tr>
<th>Year</th>
<th>Recipient</th>
<th># Cit.</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>Niklaus Wirth</td>
<td>946</td>
<td>1245</td>
</tr>
<tr>
<td>1985</td>
<td>Richard M. Karp</td>
<td>4951</td>
<td>24</td>
</tr>
<tr>
<td>1986</td>
<td>John Hopcroft</td>
<td>4542</td>
<td>34</td>
</tr>
<tr>
<td>1986</td>
<td>Robert Tarjan</td>
<td>6525</td>
<td>7</td>
</tr>
<tr>
<td>1987</td>
<td>John Cocke</td>
<td>1074</td>
<td>1017</td>
</tr>
<tr>
<td>1988</td>
<td>Ivan Sutherland</td>
<td>663</td>
<td>2152</td>
</tr>
<tr>
<td>1989</td>
<td>William (Velvel) Kahan</td>
<td>413</td>
<td>3973</td>
</tr>
<tr>
<td>1990</td>
<td>Fernando J. Corbat'o'</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Robin Milner</td>
<td>7900</td>
<td>4</td>
</tr>
<tr>
<td>1992</td>
<td>Butler W. Lampson</td>
<td>1643</td>
<td>471</td>
</tr>
<tr>
<td>1993</td>
<td>Juris Hartmanis</td>
<td>742</td>
<td>1817</td>
</tr>
<tr>
<td>1993</td>
<td>Richard E. Stearns</td>
<td>380</td>
<td>4434</td>
</tr>
<tr>
<td>1994</td>
<td>Edward Feigenbaum</td>
<td>363</td>
<td>4684</td>
</tr>
<tr>
<td>1994</td>
<td>Raj Reddy</td>
<td>270</td>
<td>6703</td>
</tr>
<tr>
<td>1995</td>
<td>Manuel Blum</td>
<td>1704</td>
<td>442</td>
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<tr>
<td>1996</td>
<td>Amir Pnueli</td>
<td>5212</td>
<td>19</td>
</tr>
<tr>
<td>1997</td>
<td>Douglas Engelbart</td>
<td>113</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>James Gray</td>
<td>3945</td>
<td>50</td>
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<tr>
<td>1999</td>
<td>Frederick P. Brooks, Jr.</td>
<td>908</td>
<td>1332</td>
</tr>
<tr>
<td>2000</td>
<td>Andrew Chi-Chih Yao</td>
<td>2019</td>
<td>304</td>
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<tr>
<td>2001</td>
<td>Ole-Johan Dahl</td>
<td>505</td>
<td>3094</td>
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<tr>
<td>2001</td>
<td>Kristen Nygaard</td>
<td>498</td>
<td>3161</td>
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<tr>
<td>2002</td>
<td>Ronald L. Rivest</td>
<td>6930</td>
<td>5</td>
</tr>
<tr>
<td>2002</td>
<td>Adi Shamir</td>
<td>3492</td>
<td>76</td>
</tr>
<tr>
<td>2002</td>
<td>Leonard M. Adleman</td>
<td>1746</td>
<td>418</td>
</tr>
</tbody>
</table>

Citation ranking of the Turing award recipients according to Citeseer

Esteem of the community does not correlate with # of citations

Differences of Disciplines – Average Citations per Article

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics/Computer</td>
<td></td>
</tr>
<tr>
<td>Social science</td>
<td></td>
</tr>
<tr>
<td>Materials science</td>
<td></td>
</tr>
<tr>
<td>Biological sciences</td>
<td></td>
</tr>
<tr>
<td>Environmental sciences</td>
<td></td>
</tr>
<tr>
<td>Earth Sciences</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td></td>
</tr>
<tr>
<td>Physics</td>
<td></td>
</tr>
<tr>
<td>Pharmacology</td>
<td></td>
</tr>
<tr>
<td>Clinical Medicine</td>
<td></td>
</tr>
<tr>
<td>Neuroscience</td>
<td></td>
</tr>
<tr>
<td>Life sciences</td>
<td></td>
</tr>
</tbody>
</table>

F. Mattern, ETH Zurich, 2008
Age Distribution of Citations for Different Fields

Cultural Differences Between CS and Mathematics

Unfair if we consider only the last 10 years (as in the ETH evaluation)?

Similar disparity between theoretical and practical CS?
Heterogeneity

- Different disciplines have different citation cultures
- CS is rather heterogeneous
  - practice vs. theory
  - small and exotic areas vs. popular areas
  - very different “cultures” in different sub-fields

Impossible to have a universal measure for CS alone

Are Citations a Good Measure?

Consider third party money/scholar vs. citations/faculty for whole CS Departments at German Universities


Consequences if two sensible performance measures are only weakly correlated?

Corr.coeff. = 0.23
Are Citations a Good Measure?

- Rank correlations of 0.22 between the peer evaluation based quality rating of Netherlands computer science groups and citation impact indicators of their papers
  - Peer rating of 42 academic computer science groups in the Netherlands in 2003 (QANU)
  - ISI database plus conference proceedings from ACM, LNCS, IEEE

Are Citations a Good Measure?

„15 Reasons Why Authors Cite the Work of Others“ (Weinstock, 1971):
- giving credit for related work
- providing background reading
- paying homage to pioneers
- identifying methodology
- identifying the original publication describing an eponymic concept
- correcting / criticizing the work of others
- disputing priority claims of others
- ...

If there are very different reasons for citations – is it then sensible to count them?
Wrong Credits?

- Sometimes, someone else earns the lion's share of citations
- Example: the important concept of NP-completeness was introduced by Stephen Cook:

  cited by: 2581

- But much more often this work is cited:

  cited by: 21087

Review and Survey Papers Versus Research Papers

![Graph showing citations over years for review and research papers.](image)
Self-Citations Boost Papers (and Careers)

- 11% of all citations are self-citations
  - analysis based on 64,842 publications and 692,455 citations
- Each additional self-citation increases the number of citations from others
  - by ~ 1 after 1 year
  - by ~ 3 after 5 years
  - by ~ 3.65 after 10 years
- There is no penalty – the effect of self-citation remains positive even for very high rates of self-citation


How to Increase Your Bibliometric Values

- Write your name on papers by your PhD students
- Ignore your publisher’s copyright: put your paper online
- Work in a popular area so that many others can cite you
- Write survey papers, not research papers
- Never change your established research area
- Avoid innovative and new (but risky) projects
- Chose catchy titles for your papers
- Emphasize quantity instead of quality
- Do not lose valuable time, avoid events like this one
- Concentrate on paper production, not good teaching
- Heavily cite your own (and your friend’s) papers
- Never publish more than a single “Least Publishable Unit”
- Cannibalize your old papers: refurbish and republish them
The “h-index”

- Has become very popular
- “The number of papers with citation number higher or equal to h”
- Example: h=23, if 23 papers have at least 23 citations
Determine intersection point with $f(x) = x$ diagonal.

$h$-index cuts off highly cited papers.

$h$-index cuts off long tail.
On the h-index

- “I argue that two individuals with similar $h$ are comparable in terms of their overall scientific impact, even if their total number of papers or their total number of citations is very different.” [Jorge Hirsch]

- “If your second-most cited publication has 50 citations, it makes no difference for the h-index whether the first has 51 or 10,000.” [Bertrand Meyer]
Comparing People

“Publish or Perish” Online Tool

Appointments Committee

Expert's evaluation of applicants for Professorship in... most important criteria, in general terms, must be the impact of the scientific output of the candidates. This has traditionally been measured using the number of publications.

A fairly recent, useful measure for evaluating impact is the so-called h-index. A scholar has an index of h if he or she has published h papers each of which has been cited by others.

The following table lists the number of citations of the most influential publications (with most citations) from each applicant, as well as the h-index of each applicant. The numbers are based on a Google Scholar search on...

<table>
<thead>
<tr>
<th>Candidate</th>
<th>Citations for top paper</th>
<th>h-index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>51</td>
<td>6</td>
</tr>
</tbody>
</table>

Although the differences are not huge, the group of top candidates emerges clearly:
Check Candidate „Bullet“

Google Scholar

[Search results]

Scholar All articles - Recent articles Results 1 - 10 of about 154 for author: Bullet.

- Bullet
- N Bullet
- D Bullet
- D Design
- N Boulanger

Essence and Accidents of Software Engineering

N Silver Bullet: Essence and Accidents of Software Engineering

By Frederick P. Brooks, Jr.

Of all the monsters that fill the nightmares of our folklore, none terrify more than werewolves, because they transform unexpectedly from the familiar into horrors. For these, one seeks bullets of silver that can magically lay them to rest.

The familiar software project, at least as seen by the nontechnical manager, has something of this character; it is usually innocent and straightforward, but is capable of becoming a monster of missed schedules, blown budgets, and flawed products. So we hear desperate cries for a silver bullet—something to make software costs drop as rapidly as computer hardware costs do.
How I Became Einstein's Co-Author

Searching for einstein and matter.
Restrict to: Header Title field Order by: Citations Introductory Usage Date Hits.
Order: citations weighted by year.

Zur Evaluation der Informatik mittels bibliometrischer... (Correct)
...Analyse Nicht alles was zählt, kann gezählt werden, und nicht alles was gezählt werden kann, zählt!

Albert Einstein, Friedemann Mattern, ETH Zurich, Switzerland
Not everything that can be counted counts, and not everything that counts can be counted.

Albert Einstein
“Using the impact factor alone is like using weight alone to judge a person’s health”

“Ranking people is not the same as ranking their papers”

The report is written from a mathematical perspective and strongly cautions against the over-reliance on citation statistics such as the impact factor and h-index. These are often promoted because of the belief in their accuracy, objectivity, and simplicity, but these beliefs are unfounded.
The „Report“ on Numbers

- “The lure of simple numbers seems to overcome common sense and good judgment.”

- “Numbers are not inherently superior to sound judgments. We should not discard peer review merely because it is sometimes flawed by bias.”

“Stop the Numbers Game”, CACM, Nov. 2007

I am offended by discussions that imply that the journal is there to serve the authors rather than the readers. […]

Academics with large groups, who often spend little time with each student but put their name on all of their students’ papers, will rank above those who work intensively with a few students. […]

Researchers who apply the “copy, paste, disguise” paradigm to publish the same ideas in many conferences and journals will score higher than those who write only when they have new ideas or results to report. […]

Those who want to see computer science progress and contribute to the society that pays for it must object to rating-by-counting schemes every time they see one being applied.
Bibliometric Evaluation of Computer Science – Problems and Pitfalls

Friedemann Mattern
ETH Zurich